THE MOLECULAR SPECTRUM OF POTASSIUM HYDRIDE

BY

ADAM CLARKE BEILER

B.S., Allegheny College, 1933

M.S., University of Illinois, 1936

AN ABSTRACT OF A THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN PHYSICS IN THE GRADUATE SCHOOL OF THE UNIVERSITY OF ILLINOIS, 1941

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New measurements on the band spectrum of potassium hydride have yielded more accurate determinations of frequencies, band origins and vibrational and rotational constants. The accuracy of the analysis involving states with v′ between 16 and 24 has been improved considerably. An accurate potential curve for the excited $^1\Sigma$ state of potassium hydride has been obtained by Klein's method.[1]

Comparison of the actual potential curve with the ionic potential curve indicates that for values of the internuclear separation, r, equal to or less than r_e the interaction is mainly one of repulsion due to penetration. For values of r slightly greater than r_e the form of the potential curve may be ascribed reasonably to strong interaction between ionic and Heitler-London states. For large values of r the form of the potential curve indicates a further interaction between the ionic $K^+ + H^-$ state and the atomic state $K(^2P) + H$. As in the case of lithium hydride, the additivity theorem is found to fail completely for potassium hydride.

The shape of the potential curve for the excited $^1\Sigma$ state of potassium hydride and the regions at which the various interactions are important are in very good agreement with predictions of the theory of Mulliken.[2] Consideration of the potential curves and other factors leads one to the conclusion that the most probable values of the heats of dissociation are $D_e'' = 1.92$ e.v. and $D_e' = 1.10 \pm 0.15$ e.v.

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2 Mulliken, R. S., Phys. Rev. **50**, 1017, 1028 (1936).

VITA

Adam Clarke Beiler was born July 8, 1912, in Berlin, Germany. He received his elementary education in the public schools of Minneapolis, Minnesota, and Meadville, Pennsylvania. He obtained the degree of Bachelor of Science from Allegheny College in 1933 and the degree of Master of Science from the University of Illinois in 1936. From 1934 to 1940 he has been an Assistant in Physics at the University of Illinois.